

# Psychological Bulletin

EDITED BY

SHEPHERD I. FRANZ, GOVT. HOSP. FOR INSANE

HOWARD C. WARREN, PRINCETON UNIVERSITY (*Review*)

JOHN B. WATSON, JOHNS HOPKINS UNIVERSITY (*J. of Exp. Psych.*)

JAMES R. ANGELL, UNIVERSITY OF CHICAGO (*Monographs*) AND

MADISON BENTLEY, UNIVERSITY OF ILLINOIS (*Index*)

WITH THE CO-OPERATION OF

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THE  
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GENERAL REVIEWS AND SUMMARIES

MEMORY, IMAGINATION, LEARNING, AND THE  
HIGHER INTELLECTUAL PROCESSES  
(EXPERIMENTAL)

BY PROFESSOR J. W. BAIRD

*Clark University*

I. MEMORY AND IMAGINATION

(a) *Imagery*.—In an investigation of the effect of various subjective and objective factors upon the evoking of visual imagery, Burt (8) found that the arousal of visual imagery of a stimulus tends to be facilitated by increase of complexity of contour of the stimulus, by increase in its size, by increased duration of exposure, by interest, and by motor reinforcement (movements of tracing its outline). The arousal of visual imagery tends to be inhibited by mental and motor distraction. The amount of facilitation is usually greatest in the case of motor reinforcement and interest, and least in the case of increased size and lengthened exposure; individuals differ somewhat, however, in their seriation of the facilitating factors. The mode of operation of these factors differs from individual to individual. Imagery of other modalities, notably kinæsthetic, may initiate or reinforce the visual image; the participation of these factors may in certain observers be essentially attentional, while in other individuals it may be essentially perseverative. In experiments with six observers, five variations of experimental procedure, Miss Clark (11) found that changes in clearness of the visual image are usually attended by objectively verifiable eye-movements; the correspondence between amount of eye-movement and kind of image is probably due to certain condi-

tions of attention; characteristic eye-movements seem to transfer from visual perception to visual imagery. She reports that however one may classify the various types of visual imagery, it is difficult to find images of pure type, the image of each type tending to blend into images of other types. Langfeld (28) assigned to his observers the task of reciting the alphabet as rapidly as possible, omitting certain specified letters. Their introspections show that their method of inhibiting the pronouncing of the forbidden letter consisted in associating (in the fore-period) some form of inhibition with an image of the letter which was to be omitted. Sometimes the inhibition of the vocal organs was directly associated with the letter; sometimes the words of the instructions served as an intermediary; or a movement of the hand or an emotion of fear constituted one term of the association. Imagery tended to drop out as the experiments progressed, but it reappeared in cases of doubt and difficulty.

(b) *Acquisition, Recognition, Reproduction.*—Gould and Perrin (24) obtained comparative records of children and adults in learning a maze. They employed a pencil maze; ten children and fourteen adults took part in the experiments. It was found that the average records of the adults were very much superior to those of the children, the superiority amounting to twenty per cent. measured in terms of the time required to make the circuit, twenty-eight per cent. in terms of the number of trials necessary for learning the maze, fifty-four per cent. in terms of excess distance travelled, and eighty-seven per cent. in terms of number of errors. The superiority of the adult is attributed to "more effective intelligence" and to "greater motor stability." Two characteristically different learning procedures were apparent—a hurried, non-analytic procedure, and a studious, analytic procedure; but there was no consistent correlation between mode of procedure and age of learner. The more efficient learner tends to make a relatively poor record at the outset and to acquire efficiency by degrees, the result being a curve which shows a relatively more pronounced initial slope and absence of steeples. The crucial part of the learning for both child and adult is represented by the first ten to fifteen trials; the ensuing trials represent the learner's effort to perfect the route. Littwin (29) summarized a number of the familiar investigations of learning, pointing out their pedagogical applications and indicating problems for future investigation.

Strong (39) investigated the relation between recognition and

length of interval between stimulations. Four books of advertisements were employed as material. In one case these were all presented at a single sitting; in another case, only one book at a sitting and the sittings one day apart; in a third case, only one book at a sitting and the sittings a week apart. A recognition-test after the lapse of a month showed that accumulated presentations are least effective and that presentations separated by an interval of a week are most effective. Advertising space is more effective when used less frequently in large amounts than when used more frequently in small amounts. In various forms of recognition experiment, where words were employed as stimuli, Dr. and Mrs. Strong (40) found that recognitive ability is capable of enormous improvement by practice; and that ability to recognize an experience and ability to localize it temporally are approximately coincident within the first few minutes after the original experience, but that the localizing capacity decreases much more rapidly than recognitive capacity. There are indications that localizing depends upon the same factors as correct recognizing. In a modified association-reaction experiment, where the same stimulus-words were presented at intervals of five minutes, one hour, and one day, it was found that an intimate relationship obtains between difference in recognitive ability and difference in association-time. The authors conclude that the process of recognizing is conditioned by a facilitation of nervous functioning—the experience of novelty and of familiarity being respectively the conscious correlate of hesitant and of accelerated conduction across the synapse. They believe that the experience of temporal localizedness is not qualitatively different from the experience of familiarity but is only a superlative stage of the latter; recognizing is a product of a relatively rough estimate of the amount of acceleration of conduction which has taken place, while localizing is the product of a more refined and accurate estimate of the amount of acceleration.

Misses Gamble and Wilson (21) sought to determine what is the significance of place-associations in recall. They presented nonsense-syllables, arranged in certain positions upon an exposure-tablet; in the test of recall (by the method of correct associates) certain syllables were presented in their original positions upon the tablet, while others were presented in "wrong positions." It was found that remarkable individual differences manifest themselves; on the whole, however, "right position" has a slightly greater tendency to evoke the correct associate than "wrong position,"

and to give rise to a more prompt recall. In a second experiment the same investigators presented nonsense-syllables by means of an exposure-tablet (simultaneously and with definitely spatial positions) and by means of a rotating drum (successively and with a constant and uniform spatial position), the total presentation-time being identical in both cases; in the test of recall, the stimulus-syllables were all presented in one particular position upon the tablet. Here again it was found that place-associations may be a really significant factor in recall. Of these two experiments, the former shows that the recall of one syllable by another is blocked if measures are taken to make the place-syllable associations interfere with one another; and the latter shows that syllable sequences are recalled better if the presentation is of such a sort as to foster the establishing of place-associations.

In experiments with 165 college students Gates (23) found that the average memory span for digits is 7.7 in auditory presentation, and 8.2 in visual presentation. When the length of the list presented exceeds the memory span the average efficiency of reproduction is decreased; there is, however, a type of individual (about eight per cent. of the group) whose reproduction is not impaired by the lengthening of the list. Miss Bennett (3) presented nonsense-syllables, digits, nouns and sentences in both visual and auditory fashion to nine observers. She determined how many elements of each sort of material could be reproduced immediately after a single presentation; and she also determined how many presentations were necessary in each case for a complete memorization of the material. She found a high correlation between the records obtained from the visual presentation and from the auditory presentation of each sort of material; and there are indications of a high correlation between ability to reproduce much after a single presentation and ability to memorize completely with few presentations.<sup>1</sup>

Miss Gamble (20) investigated the relationship between rate of repetition and tenacity of impression. Lists of nonsense-syllables were presented in auditory fashion, at five different rates varying between fifteen syllables per minute and seventy-five per minute. The tenacity of association was measured by the number of repetitions necessary for re-learning after an interval of two weeks. Marked individual differences manifested themselves in these experi-

<sup>1</sup> The author's meaning is not altogether clear; the reviewer infers from the context that she employs the term "mediate retention" in the sense of "complete memorization."

ments; of the four observers to whose results the author attaches greatest significance, two remembered the slow series better and two remembered the fast series better. There seems reason to believe that in those cases where rapid presentation proved to be more advantageous the advantage was due to the fact that the learners found it more difficult to maintain a keen concentration of attention when the rate of presentation was slow. Myers (33) asked fifty normal-school girls to study groups of words and figures with a view to reproducing them in exact order; he permitted them to devote as much time as they wished to the task. When the learners were grouped on the basis of degree of perfection of recall, it was found that the less perfect group had devoted less time to learning the material (490 seconds as compared with 531 seconds) and that they required more time for recall (220 seconds as compared with 123 seconds). Lyon (31) aimed chiefly to determine what relationship obtains between rapidity of learning and excellence of retention; but the investigation also touches upon various subsidiary problems such as the relation between memory for coherent and non-coherent materials, and the influence of age, sex and education upon learning and retention. The author's materials consisted of digits, nonsense-syllables, disconnected words, and selections of prose and poetry; his procedure consisted in recording the learning-time and subsequently (after intervals varying from one day to ten weeks) in testing retention either by a method of free reproduction or by a method of relearning. The learners, 426 in number, ranged between fourteen and thirty years of age; and they represented various degrees of education and various levels of society—students, instructors, business men, and inmates of prisons, workhouses and insane asylums. The author finds that the relation between rapidity of learning and excellence of retention can not be stated in any single general formula. The relation varies with variation in the quality of the material to be learned, and with variation in the length of interval between learning and recall; then, too, the several methods of measuring retentiveness furnish discordant results. The following general statements seem to be justified: When material is logically coherent the rapid learner proves to be more retentive; but the converse is true in the case of non-coherent materials. Individual differences in rapidity of learning are greater than individual differences in retentiveness. Women and girls learn more rapidly but retain less efficiently than men and boys. The rapid learner tends to employ

rhythm, to make use of the whole procedure in learning, and to rely upon his natural learning-type rather than to have recourse to a multiplicity of images from unusual modalities.

Günther (26) describes a number of early memories and reports the results of an unusual opportunity to test the fidelity of one of them. He had removed from his birthplace at the age of five and a half years and had not revisited the scene until twenty-five years later. Previous to this visit he sketched a plan of the house and grounds as he remembered them; employing this sketch as the basis for a test, he found that his fidelity of remembrance amounted, after a lapse of twenty-five years, to 81.5 per cent. In an investigation of the recalling of almost completely forgotten materials, Dr. and Mrs. Myers (34) asked their six observers to attempt to recall selections of prose and poetry which they had once been able to quote, but which were now almost completely forgotten. The records of these experiments, and of an additional experiment which consisted in recalling the names of former classmates, show that the total amount re-acquired in subsequent recalls was approximately twice as much as the content of the first recall; casual suggestions from visual and auditory stimuli, and from movements, ideas and feelings, served as factors in this process of re-acquiring fragments; feeling and general attitude of the observer toward his task was an influential factor in determining the success of the attempt to recall; the recall of rhyming words proved to be of great service in retrieving the rest of the stanza; the feeling of certainty that a given recall was accurate was usually well-founded, but the subjective assurance that the observer was unable to recall was frequently ill-founded.

Conard and Arps (12) undertook to determine what advantage is derived from the use of an "economical" method in the teaching of the fundamental operations of arithmetic—the method consisting in teaching the pupil to "think results only" (for instance, in the problem  $8 + 5 + 7 + 9$ , to think only of 13, 20, and 29). A group of thirty-two pupils was drilled for eight working-periods by means of this economical method, while a similar group was drilled for an equal number of periods by means of the "traditional" method. A final test showed that the "economical group" were now superior by thirty-three per cent. measured in terms of accuracy, by sixteen per cent. measured in terms of rapidity. In Wells's experiment (43) two practiced typists wrote from unfamiliar copy on each of fifteen days; two experimental sittings of five

minutes' duration took place each day, at the beginning and at the end of the regular forenoon's work. The instructions for the first ten days emphasized the desirability of speed, and for the last five days they emphasized the desirability of accuracy. The chief portion of the author's discussion is devoted to an analysis and description of the various sorts of errors, which he seeks to refer to different psychical levels. In a preliminary experiment Boswell and Foster (5) presented a story and a group of objects to each of two classes, in one case with the instruction that recall would be tested after twenty-four hours, in the other case with the instruction that the test of recall would be deferred for several weeks. In both cases, however, the test took place after several weeks, when it was found that those individuals who had learned for purposes of temporary retention were less successful in recalling the material than those who had intended to retain it for a longer period of time. In a second experiment, pairs of English-Chinese words were presented; and here again the learners were instructed in certain cases that the list was to be learned for temporary retention, while in other cases they were instructed that it was to be learned for permanent retention. The recall of all of the lists was tested (by the method of correct associates) after an interval of five minutes, and again after an interval of two weeks. The results show that slightly more of the "temporary series" than of the "permanent series" could be recalled after five minutes, while after two weeks the ability to recall the "permanent series" was slightly superior to the ability to recall the "temporary series." Remarkably enough, however, the recall-times show the opposite relation—after five minutes, recalling was slightly more prompt in the case of the "permanent series," but after two weeks it was slightly less prompt in the case of the "permanent series." The introspections of the observers revealed no constant or uniform differences between the modes of learning or the modes of recall in the two cases, although several observers reported that in the "temporary series" they were more concerned with the establishing of meaningful associations. Peterson (36) presented lists of words to classes of university students, in one case having the words copied without intent to learn, in the other case with intent to learn. Retention was tested by a method of free reproduction, immediately after presentation and again after an interval of two days. The results show that intent to learn is an influential factor, and that its effect upon delayed reproduction is considerably greater than upon immediate

reproduction—the increase in memorial effect being fifty per cent. in the former case and twenty-two per cent. in the latter case. The author believes that the effect of the intent is due to a difference in the degree of definiteness of the response-attitude in the two cases, and that the more definite response-attitude facilitates the establishing of certain definite associations.

Brugmans and Heymans (7) confirm Brown's finding<sup>1</sup> that less time is required for the reading of a list of color names than for the naming of a list of color stimuli. In supplementary experiments they found that the reading-time for words and digits is less than the naming-time for the corresponding objects; and that while the reading-time for unfamiliar symbols is longer at the outset than the naming-time for the corresponding objects, it soon becomes less as the result of practice. From these and other experimental findings the authors conclude that this difference in time required for reacting to verbal and to non-verbal material can not be explained from a difference in practice nor from a difference in the strength of the associations involved, as has been held by other writers; they believe, too, that Brown's assumption of a radical difference in physiological processes involved in the two cases does not contribute to a solution of the problem. Brugmans and Heymans, on the contrary, hold that the phenomenon is due to the fact that the reading attitude differs essentially from the naming attitude, the former giving rise to associative processes whose direction of conduction is more definitely determined toward a specific goal. When a verbal stimulus is presented it appeals to the reagent as a word to be pronounced; the associations aroused are therefore more definitely determined as to their direction, and hence they function more promptly in evoking the appropriate speech-movements. But when the stimulus is of a non-verbal sort its associative resultant is distributed instead of being concentrated in a single direction—for instance, a color stimulus may recall any object of similar color in nature or in art; and since in consequence of this multiplicity the associations tend less to issue in a single direction, interference is more likely to occur and the response is less prompt.

(c) *Practice, and the Transfer of Training.*—Since efficiency improves with practice, Fernberger (17) raises the question as to how many determinations must be made in an anthropometric test, and

<sup>1</sup> W. BROWN, Practice in Associating Color Names with Colors. *Psychol. Rev.*, 1915, 22, 45-55; summarized in this BULLETIN, 1916, 13, 347f.

how much practice should be acquired before one can be sure that the measurement of the subject's sensitivity is accurate and reliable. An investigation of this problem indicates that in lifted weights fifty determinations upon each comparison-pair is the minimum number upon which a measurement of sensitivity can safely be based. Boring (4), however, points out that the importance of practice consists not so much in its effect upon the magnitude of the limen as in its effect upon constancy of judgment; and he holds that in view of the extreme diversity of purpose for which limens are determined, it does not seem safe to place an arbitrary limit upon the number of observations. Harris (27) published data concerning 15,200 estimates of the number of objects contained in groups. The three observers were able to compare their estimates with the true value, and thus they had an opportunity to profit from their experience. An analysis of the data shows that experience seems to have but little influence upon personal equation, but that it tends to give rise to a greater steadiness of judgment. In Phillips's experiment (37) pupils in each grade, from the fourth to the eighth inclusive, were asked to add continuously (or to subtract or to multiply continuously) for a period of ten minutes, the score for each minute being recorded separately. It was found that from six to twelve per cent. more work is accomplished in the first minute than in any of the subsequent nine minutes, from which the author infers that an individual's ability in the fundamentals of arithmetic may be determined from what he accomplishes in one minute of work.

Chapman and Miss Hills (9) publish records of weekly tests of efficiency made upon 100 members of a typewriting class in a school of commerce. They find that negative acceleration in improvement is not an invariable characteristic of the curve of learning; positive acceleration (concavity of learning-curve) was found to be a frequent phenomenon and to continue through as many as sixty hours of practice. Murphy (32) undertook to discover what effect various distributions of practice have upon the acquisition and the retention of skill. Groups of normal-school students practiced throwing a javelin at a target, one group practicing five times a week, another group twice a week, a third group once a week. Unfortunately, the scores obtained by the various groups are incomparable with one another, and hence they do not throw any light upon the author's problem. In Thorndike's investigation (41) sixty-four educated adults practiced writing the

products of numbers—the practice, which entailed the writing of 3,840 products, being distributed differently for each of the six groups. The practice was preceded and followed by a test of efficiency. Improvement was found to be universal and large, amounting to an increase of one hundred per cent. of performance and a decrease of fifty per cent. of error. It turned out that when 640 multiplications are made in a single day, they are more profitably done at a single sitting than at four sittings; that whether practice is daily or every other day makes little or no difference in the improvement; and that whether practice is distributed over twenty-four days or accumulated into six days makes little difference provided the long day's work is done at one sitting. Individual differences are very great, certain individuals improving fifteenfold more than others; the most rapid workers tend to be most accurate; as to the form of the work-curve, there is no evidence of initial spurt and very slight evidence of final spurt. In a second investigation it was found that of fifteen college students who practiced typewriting, checking numbers, adding and multiplying, those who possessed initial high ability improved most—excepting in the case of typewriting where the opposite relation was found to hold. In a third investigation, Thorndike attacked the problem of the effect of work and rest upon mental efficiency—the mental function tested being ability to master the meaning of a paragraph. Twelve paragraphs were assigned, ten to be read at a continuous sitting, the other two after a period of rest. It was found that during the continuous sitting the time required for mastering the meaning increases slightly (about five per cent.) as the work is continued; and that it decreases by about fifteen per cent. after a period of rest. The quality of the work remains approximately constant throughout. In a fourth investigation Thorndike assigned to his observers the task of multiplying three-place numbers by two-place numbers; in one case a rest of twenty minutes was introduced after every five multiplications; in another case a rest of ten minutes was introduced; and in a third case the work proceeded continuously. The results show a slight advantage in favor of the ten-minute rest, both in immediate achievement and in subsequent effect.

Batson (2) investigated the process of acquiring skill in motor activities of different degrees of complexity. He found that no plateau appears in the learning-curve in cases where the learning consists in establishing a sensori-motor association of a very simple

sort, and where, therefore, the improvement is the product of a single factor—for instance, in learning to make such accurate estimations of time as would ensure success in striking a specified point upon a moving target. When the acquisition of skill is the product of several coöperating factors—as in learning to toss and catch a number of balls—the learner may adopt a procedure in which he distributes his attention more or less uniformly over the various factors, and he may by this means acquire control over them as a group; in this case again there is no plateau in the learning-curve. But if his procedure consists in isolating the factors and then in successively mastering each factor independently before proceeding to master the others, his learning-curve will be characterized by plateaus. Batson also discusses the influence of various subjective and objective factors, the phenomenon of warming-up, and the permanence of improvement.

Evans (16) studied the effect of distraction upon reaction-time. Reactions to visual, auditory and tactual stimuli were each subjected to visual, auditory and tactual distractions. Records obtained from six reagents show that all modalities of distraction lengthen reaction-time to stimuli of all modalities, the distractive effect being greater when the reaction-stimulus and the distraction-stimulus belong to the same modality. The distraction effect was decreased by practice, but was never wholly overcome. In a second experiment, six reagents practiced reacting to visual and auditory stimuli, both with and without distraction. Before and after the training they were tested in reactions to visual, auditory and tactual stimuli, both with and without distraction. It was found that practice in reacting to a given stimulus with a given distraction improves the reaction to a stimulus of different modality with the same distraction, and to the same stimulus with distraction from another modality. The author refers this improvement to a changed attitude or adjustment on the part of the reagent, which in turn is held to be a product of training in habits of attention. In Mrs. Cowan's experiment (14) lists of words and lists of nonsense-syllables were presented to children who were assigned the task of isolating as many pairs of words or syllables as possible and then of attending to each of these pairs. To this task the children devoted five minutes on each of forty days, the object being to train them in a "habit of attention." Tests of immediate recall of objects and selections of prose were made before and after this period of training. It was found that the practiced group showed

slightly greater improvement in memory for objects and in memory for prose than did the unpracticed group.

Coover's investigation of the transfer of training (13) covers an unusually wide range of mental functions, including sensory discrimination in several modalities, compass of attention, simple and complex reaction involving discriminations and choices of various sorts, the learning and reproducing of various sorts of material, etc. His findings demonstrate the existence of transfer throughout; and while he publishes numerous quantitative statements of the amount of transfer which took place in the several cases, the major portion of his discussion is devoted to an analysis of the factors upon which transfer depends. From the introspections of his observers Coover finds that practice in any activity tends to divest the activity of its adventitious accompaniments; when the activity is of a more complex sort it frequently happens that the reagent adopts a wholly new and more economical procedure in consequence of his training. He tends to acquire a more appropriate distribution of attention over the component processes and over the various possible reactions which he may be called upon to make; he is no longer delayed by non-essential concomitants nor distracted by extraneous stimuli; his attention becomes less variable and more capable of sustained concentration; his several modalities of imagery coöperate more effectively for purposes of recall; a greater number and variety of associative and apperceptive processes come into function, thus insuring a more accurate perception and a more complete and trustworthy reproduction. And since each of these factors may participate in other activities than the specific activity practiced, the effect of the practice may extend beyond the limits of the specific activity. In so far as the practice effect has to do with the material of experience (imagery, representative schemas, and the like) the author employs the term "transference of training"; in so far as the practice effect involves the form of experience (attitude, control of attention, elimination of non-essential concomitants) the author prefers to speak of "spread of training."

## II. CONDITIONS WHICH AFFECT MENTAL FUNCTIONING

Chapman and Nolan (10) find that in the task of adding continuously for a period of sixteen minutes (twenty girls, seven working-periods each) much more is accomplished during the first minute than during any subsequent minute—the efficiency during

the first half-minute being twenty-nine per cent. greater than the average efficiency of the last twenty half-minutes of the working-period. Gates (22) reports an investigation of diurnal variations in memory and association. Groups of college students, 165 students in all, were tested at each hour of the day from eight in the morning until five in the afternoon. The tests included visual and auditory memory span, substituting, recognizing, and the remembering of coherent verbal material. It was found that average efficiency in all of the functions tested follows an irregular diurnal course, increasing progressively to a maximum at about ten in the forenoon and dropping to a minimum shortly after noon; the afternoon wave follows a somewhat similar course but the limits of variation are less wide here. Miss Curtis (15) aimed to discover whether the rapid repetition of materials to be learned is more fatiguing than the slow repetition. Her seven observers memorized lists of nonsense-syllables which were presented in auditory fashion, both the time and the number of repetitions necessary for complete memorization being recorded. In a preliminary series of experiments the investigator determined for each observer a rapid rate and a slow rate of presentation which gave equal learning-times. Various means of measuring fatigue were tested, none of which proved wholly satisfactory; it was finally decided to measure the amount of fatigue present by a multiplication test and by the observer's progressive loss of efficiency in memorizing. It turned out that those learners who made much use of visual imagery preferred a slow rate of presentation, while those "who appear to have been greatly aided by auditory-kinæsthetic pre-severation" preferred a rapid rate of presentation. The results of the investigation are not wholly conclusive, due apparently to the presence of pronounced individual variations.

Fernberger (18) investigated the influence of mental and physical work upon judgments of lifted weights. The mental work assigned to his five observers consisted in mastering the content of difficult German prose, the work-period having a duration of thirty minutes; the physical work consisted in exercising the muscles of the right hand and forearm to the point of exhaustion by means of an ergograph. One hundred comparisons of lifted weights were made by each observer before and after the work-period. The mental work seemed to have no influence upon the judgment; but the physical work (which involved the same muscle-groups as were employed in the lifting of the weights) had a pronounced effect in

decreasing the ability to compare lifted weights. Painter (35) raises the question as to whether the onset of mental incapacity in consequence of extreme fatigue is abrupt or gradual. Does the exhausted worker find it possible, say, to multiply three-place numbers when he is no longer able to multiply four-place numbers? The author devoted himself continuously to the task of multiplying four-place numbers until he was no longer able to continue with the task (the duration of this sitting was slightly more than four hours). He found that the ability to do mental multiplication does not tail off gradually but terminates abruptly; at the stage where the ability to multiply four-place numbers is no longer present one finds it impossible to multiply any number by any other number.

Thorndike, McCall and Chapman (42) report an investigation in which forty students were submitted to various tests of mental efficiency (cancelling digits, naming colors, naming opposites, adding and multiplying) under widely different conditions of ventilation—varying between a hot, humid and stagnant condition of air, 86° F. with eight per cent. relative humidity, and an optimum condition, 68° F. with fifty per cent. relative humidity, forty-five cubic feet per person per minute of outside air introduced in the latter case. It was found that the students did as much work, that they did it as well, and that they improved as rapidly in the ill-ventilated room as in the well-ventilated room. Reed (38) assigned various tasks (silent reading, counting, adding, writing, multiplying) to his thirteen observers, and obtained graphic records of the tongue-movements which occurred during the performance of these tasks—the investigator hoping by this means to throw light upon the question as to the functioning of “inner speech.” It was found that in certain observers, movements of the tongue are present throughout, in other observers they are never present, while in a third group they are present in the case of certain tasks but not in the case of other tasks (most frequently present in writing, least frequently in counting). From these and additional experiments where vocal-motor distractions were introduced, the author concludes that “inner speech” does not play an important rôle in mental functioning.

Miss Bronner (6) discusses the influence of attitude and emotion upon intellectual efficiency, and cites cases where indifference, ill-will and deceit on the part of the examinee were influential factors; and where such emotions as anger, fear, shame and the like vitiated the diagnosis. Lodge and Jackson (30) measured

the immediate reproduction (for passages of prose) of 179 college students. The reproductions are evaluated both by a qualitative method, which gives credit for organization and coherence of product, and by a quantitative method, which merely assigns a unit credit for each idea reproduced. The results indicate that the freshmen are the most intelligent group, a finding which the authors believe to be due to greater "natural ability." Students below the age of twenty-five tend to obtain a higher score than students above that age, and the women obtain better scores than the men. The authors conclude that the qualitative method of treating results is to be preferred.

### III. HIGHER INTELLECTUAL PROCESSES

Bartlett's investigation of perceiving and imaging (1) consisted in presenting materials (geometrical figures, pictures, ink-blots) and in subsequently asking his observers to report what they had seen or what they had imaged or been reminded of during the presentation. The presence of symmetrical features and novel features facilitates observation and subsequent representation; features at the top of the figure are more readily observed than features at the bottom. Observers tend to label, to criticize, and to evaluate the stimulus during the process of observing; but the most striking phenomenon is the observer's effort to find a meaning. This phenomenon is invariably present. Without it perception is impossible; and the various component processes which constitute a developed act of perceiving are to be regarded as ways in which the effort to find meaning express themselves in the presence of objective stimuli. In a complete act of perceiving may be found processes of imaging (a situation or an object is reinstated from previous experience) and processes of thinking (relations are apprehended). Both of these involve a freeing of the content from its sensory background, and the freeing may proceed so far that the processes take place in the complete absence of sensory stimulation. Imaging tends to retain a characteristic definiteness of content, and to be attended by well-marked feelings; thinking may be equally definite, but the definiteness appears as a characterization of that which is thought about, and feeling is here minimal.

In a study of the evolution of the concept, Gregor's procedure (25) consisted in having children and adults define the meanings of various concrete and abstract terms—chair, brain, crime, lease, cause, contradiction, sympathy, etc. He found that the concept

passes through a number of characteristic developmental stages. The primitive form of defining an object consists merely in stating its purpose or use ("a chair is something for sitting on"); or the defining of a term may consist simply in enumerating the varieties of object to which the term refers. From this primitive origin there gradually evolves a stage in which abstract terms and supra-ordinate concepts are employed, in groping and stumbling fashion at first but gradually more accurately and pertinently. The new concept may develop from a familiar one ("lease is a kind of buying;" "lease is buying something for a year"). At the lower stages of this evolution, accurate and refined differentiation is lacking and hence early connotations are too inclusive; the narrowing down to proper limits is a gradual process in which current forms of speech are among the most influential factors. Miss Fisher (19) investigated the process of abstraction and its product, the general concept. Her experimental material consisted of several series of pen-and-ink drawings of complex colored figures, each figure containing certain general features which were common to all the figures of the series, and certain particular or non-common features; a nonsense-name which designated the series was appended to each figure. These figures were presented in successive fashion, the observer being instructed that he would subsequently be asked to define the group term which designated the series, and to furnish an introspective description of the mental processes and procedures involved throughout. It was found that the process of abstraction is characterized by a succession of imaginal and sensational contents; the essence of the process, however, consists not in the mere presence in consciousness of these contents but in a characteristic behavior or mode of functioning of these contents. And this behavior can best be described in terms of their variations of relative clearness and focality, together with changes in their durative aspects (their rate of emergence, their degree of persistence, and their abrupt or gradual disappearance). Those contents which prove to be general or common obtain an ascendancy over the other contents and prevail in consciousness, while the non-common contents remain unclear and non-focal or sink into oblivion. The visual predominance of the common features was frequently attended by vocal-motor processes of labelling and verbal characterization, by actual or ideated movements of tracing their outlines, and by experiences of imitating and empathy. The mental representation of the concept passed through a series of developmental stages as the

observer's familiarity with the series of figures increased. At the outset, the concept appeared in the form of definite and detailed concrete imagery, usually of a visual or kinæsthetic sort, which was frequently subject to panoramic mutations; but as the experiments progressed these detailed images were supplanted by imagery of a more and more abbreviated and schematic form. Meanwhile, verbal imagery (usually vocal-motor) was assuming a progressively more important rôle, until a stage was reached where the concept appeared almost exclusively in verbal terms. At a later stage, these verbal images in turn became more and more schematic and fragmentary and more and more telescoped, until finally there came a mechanized stage where, after sufficiently frequent recurrence, conscious representation of the content of the concept was wholly lacking—the request to define was here followed immediately by an automatized flow of verbal statement.

Wolters's investigation (44) aimed to discover whether there is any psychological difference between the affirmative judgment and the negative judgment. He assigned various problems to his seven observers, and had them give introspective descriptions of the mental processes involved in solving these problems. The problems were of two sorts: In certain cases an epithet or a predicate was to be supplied by the observer—here in the non-affirmative instances one is concerned with what the author calls “negatives of construction”; in other cases the observer was required to pass judgment upon the correctness of a statement or a picture—the non-affirmative instances are here called “negatives of denial.” An examination of the protocols shows that affirmative judgments and negative judgments do not differ in mental content or in the mental processes by which they are mediated. The two forms of negation, however, (negatives of construction and negatives of denial) are psychologically distinct. The negative of construction differs from the corresponding affirmative only in its verbal expression; logical theory distinguishes between affirmative propositions and negative propositions but there is no psychological difference between the judgments which underlie the two. Whether the resulting proposition is to be affirmative or negative, the course of the judgment is identical in the two cases; it is determined throughout by the thinker's purpose. The negative of construction demands the prior formation of a positive judgment, but the denial of a proposition may be immediate—it may take place without any previous analysis or positive judgment. The denial-negation

is a definite experience which is chiefly emotional in character but it may also contain kinæsthetic and other sensory ingredients. It is essentially a mental disturbance, a complex attitude of caution or even hostility. The corresponding consciousness of agreement or acceptance is less striking and less characteristic. The denial-negation, with its conspicuous components of emotion and kinæsthesia, has probably evolved from a primitive form of reaction; it has elements in common with the animal's combative resistance to interference.

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## VISUAL SPACE

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Only a few contributions to the literature on visual space were added during the past year. Buhler (2), in a very serviceable encyclopædic dictionary in the German language, gives a standard account of the laws and characteristics of visual space perception.

The advantage of side, or uniocular, vision over front, or binocular, vision to the moving animal in gauging the relative distance of objects, is convincingly discussed by Trowbridge (6). When a bird or mammal with lateral vision moves forward, the principal visual axis is perpendicular to its motion, giving the maximum apparent displacement of objects with every forward movement. Distance is judged by the relative displacement: objects near at hand suffer greater displacement than those more distant. This principle should be considered in any theory of orientation implying a sense of direction. Dabney (3) supplements Professor Trowbridge's article by calling attention to the fact that in estimating distance there may occur a "trigonometric operation, in which the distance between the eyes is the base of a triangle, the two lines of vision converging upon the observed object, being the other sides of the triangle."

Watt (7) upon a deductive and somewhat arbitrary foundation, denies the possibility of kinæsthetic components in visual perception of depth. Muscular sensations of convergence and accommodation do not fuse with purely visual sensations into a complex, nor do labyrinthine sensations fuse with the visual. Perception of distance, as in stereoscopy, is due to visual factors solely. Stereoscopic vision is primarily the production of a third direction or dimension of *form*, not space. The primary psychological factor in stereoscopic vision is the binocular disparation of form.

Ritter (4) reports an experimental study of the well-known tendency toward the overestimation of vertical distances. She

connects this with an opposite tendency toward underestimation of horizontal distances. These tendencies, in their coöperative or antagonistic effects, were studied for the eight radii at 45 degree intervals. The author contends that it is possible to conceive of the meridional disparities in the visual field as reducible ultimately to retinal structure on the one hand and to a simple act of visual attention on the other. The macula is wider in its upper than in its lower extent, and four times greater in its transverse than in its vertical diameter. The lower visual field is more critical for life interests and is viewed by the upper, wider, portion of the macula. The panorama of the earth's surface stretches out in its infinite detail in the *horizontal* direction. Readiest attention is given to the fields most fraught with sudden emergencies. This correlation of the illusions with retinal structures and attention is at least suggestive.

Smith (5) studied the apparent alteration of one line when seen in connection with a longer or shorter adjacent line. Contrast was found not to be distinctly and generally operative in modifying the apparent length of a line. It may however be present with other conditions, such as confluence, which sometimes do and at other times do not permit it to appear. Men show more evidence of the influence of contrast, women of confluence.

Arps (1) describes, with full case history, an instance of double inversion in a seven-year-old boy. The case offered opportunity for the study of the reconstruction of space perception through a new association of visual and tactual elements, where the new sensory elements were the direct opposite of the original association.

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## SPECIAL REVIEWS

*Three Contributions to the Theory of Sex.* S. FREUD. (Trans. by A. A. Brill.) New York: Nerv. & Ment. Dis. Pub. Co., 1916.

Taken as the product of the pen of one whose profession gives unusual opportunity for collecting data in the field of the human sexual life, the *Three Contributions to the Theory of Sex* may be recommended to the reader who desires to dig out the psychological and behavioristic facts upon which Freud bases his hypothesis of sex. When we strip off the much-criticized terminology—the libido, the unconscious, the censor, the pleasure and reality principles, the complex—we have left Freud's statement of certain facts concerning typical developments of sexuality from infancy to maturity.

Adult sexuality is the product of the concurrence of many "partial" tendencies, all of which have a pre-pubertal history. These infantile tendencies possess the following characteristics: (1) They are relatively undifferentiated in the two sexes; (2) they are not integrated into a complex whole; (3) they are not necessarily nor, chiefly, concerned with the genital mechanisms; (4) they are primarily auto-erotic; (5) they tend toward an "incestuous" fixation upon the parent. At puberty there occur typical modifications of behavior which involve normally the reorganization and the inhibition, in whole or in part, of the infantile tendencies. These inhibitions Freud calls "repressions" to indicate the fact that the infantile tendencies persist, as neural dispositions perhaps, and may become active once more in post-pubertal behavior and thus upset the normal course of development. The factors that determine the repressions are various: chemical, neural, social. The child leaves behind its undifferentiated bisexuality and becomes a man or a woman. The one or the other set of component tendencies is repressed. This is basically conditioned, Freud believes, by a differentiation in the chemical nature of the secretions of the genital glands. Again, the several relatively independent auto-erotic activities of childhood are either repressed or modified, and reorganized into a complex system that is subordinated to the functioning of the genital mechanism proper. This is essentially a function of the reorganization of the neural mechanisms of infantile

behavior into a chain of reflexes that has its terminus in the sexual act. The patterning of this system of neural arcs, as of the arcs of the infantile tendencies, is conditioned in part by hereditary factors; but Freud would wish to emphasize, on account of his interest in therapy, the large *controllable* environmental factor. And finally, the exclusive fixation of the child's affection upon the infantile love-object, usually the parent, is repressed by the erection of the incest-barrier and replaced by the striving after the mate. This third type of repression is primarily a matter of social and institutional control. Thus the connotation of the term *repression* becomes very broad indeed, including as it does organizing and inhibiting processes of divers kinds. Yet broad though its meaning be, there is one connotation popularly assigned to the Freudian term which it certainly does not have for Freud. Repressions are *essential* for normal development, and they are not, as is popularly supposed, necessarily abnormal. Abnormalities arise when certain aspects of infantile tendencies are imperfectly repressed or inhibited. Such tendencies may crop out in post-pubertal behavior and find abortive expression in neuroses, perversions, inversions, fetichisms, etc. Or, on the other hand, from them may also develop all the cherished products of civilization: the inventions and the arts, myth, religion and science. When this is their fate, they are called "sublimations." Thus imperfectly repressed infantile tendencies may develop on the one hand into pathological behavior, on the other into human culture.

Limitations of space preclude adequate criticism of the volume. Quite apart from Freud's much criticized theoretical postulates, it yet remains true that his exposition of the facts of human sex behavior has succeeded in attracting the attention of psychology and in stimulating criticism in a degree that is unequalled by any other writer on the subject. It is unfortunate, however, that he has couched the greater part of his presentation in terms of male behavior, which is treated as the type. Such a procedure not only reacts upon his theoretical postulates and makes them less usable, but it also forces the peculiarly female functions and attitudes out of focus and ignores important differences. It becomes increasingly clear that if further progress is to be made, it will be necessary to abandon the problem as it now stands: the inquiry into the nature of the mechanisms that yield pleasure to the organism, and to envisage it as the problem of reproductive behavior. The orgasm, yielding the "end-pleasure," may constitute the physiological

terminus of normal reproductive behavior in the male, but in the female the physiological cycle of reproduction is normally completed only at parturition—a fundamental difference which no adequate account may ignore.

*The Significance of Psychoanalysis for the Mental Sciences.* O. RANK & H. SACHS. (Trans. by C. R. Payne.) New York: Nerv. & Ment. Dis. Pub. Co., 1916.

In a monograph entitled *The Significance of Psychoanalysis for the Mental Sciences* Otto Rank and Hanns Sachs, of Vienna, attempt to apply concretely, in the fields of social and folk psychology, the Freudian conception that the processes and products of civilization are essentially the modified or sublimated expression of infantile sexual tendencies that somehow escaped repression. Three points are emphasized throughout. First, that sex rather than food-activity is the source of civilization because "to the hunger instinct which is served only by immediate real gratification, the world of phantasy stands immensely farther away than to the sexual instinct." Sexual tension, finding no direct expression by reason of social taboos, is released in symbolic acts. Thus the making of fire and the ploughing of soil arose as modifications of sex behavior, and it is only later that they become integrated into the civilized food-process. Secondly, great emphasis is placed upon the "incest-barrier" as a factor in civilization. Myth, religion, cult and ritual are not the organization of the ideals of the group, but mechanisms for allowing a "harmless" expression of forbidden incestuous strivings by way of imagination and symbolic acts. It is a strange picture of human culture that is presented to the reader—a picture in which man's spiritual treasure is portrayed as being essentially the product of the creation of barriers between the son and the mother! And finally, the antithesis between the "real" and the "mental" recurs throughout. "Reality" is overt response to physical stimulus, and in the degree in which this sort of behavior is repressed we have increasing "unreality" which is identified with the "mental." Thus we are told that, in the philosopher, there is "a much farther forced diversion from sexual into mental, transcendental, unreal" than in the artist. The rise of the ancient antithesis between thought and reality in this psychoanalytic setting becomes significant on account of the implied correlation between the inhibition of overt behavior and the occurrence of conscious processes.

*Mechanisms of Character Formation: An Introduction to Psychoanalysis.* W. A. WHITE. New York: Macmillan, 1916.

White's volume on *Mechanisms of Character Formation* not only presents the psychoanalytic point of view to the lay reader, but also introduces him to much pathological material that hitherto was largely inaccessible to him. Through the pages of this book the "libido" of Freud and Jung, the "élan vital" of Bergson and the "will to power" of Nietzsche seem veritably to flow as a living stream. There is not only the libido of hunger and of sex, but every organ of the body has its own special libido. Thus we learn that defective vision is "a defective use of eye libido." The "unreality" of the psychical does not trouble White. It is interesting to note that where the European follower of Freud emphasizes the point that the formation of the symbol is indicative of a "renunciation of reality," the American disciple sees it as a "carrier of energy" exquisitely fitted for increasing man's control over his environment, for it is "the vehicle for the carrying of energy from person to person, from the past into the present and into the future." "The energy bound up and concentrated in the symbol is hardly capable of measurement by the crude methods of calorimetry." "The symbol 'patriotism' may release the energy of a whole nation just as in the individual the symbol 'contest' may mobilize the liver sugar and discharge it into the blood." The book abounds in interesting hypotheses tentatively entertained. By way of Fabre's spiders that lived for seven months apparently without taking food, he comes upon the hypothesis that the animal organism may possibly utilize solar energy directly, without fixation by chlorophyl. He then advances the curious suggestion that "the hundreds of thousands of receptors at the surface of the body" constitute "a real and material source of energy which has been, largely at least, overlooked." Here the critical reader must necessarily be troubled by the vagueness of the conception of energy with which psychoanalysis operates. Taken all in all, the reader cannot come away without a feeling of the actuality of the cosmic urge at the root of life. And while he has a glimpse of the awful abysses toward which this cosmic urge may drive the human spirit, he comes away also with a new faith in the possibility of intelligent self-direction and educational guidance. And herein lies the value of the book.

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## DISCUSSION

A LIBRARY CLASSIFICATION FOR BOOKS ON  
PSYCHOLOGY

Any library classification of scientific books is necessarily arbitrary. Usually the schemes are constructed from a logical point of view rather than from a utilitarian one, hence there is a certain antagonism between the needs of the classifier and of the user of the books. When the complaint is from one party only, it is difficult to apply a remedy, but when objection comes from both the classifier and the user, the application of a remedy is possible. Psychology in its rapid development has outgrown any scheme of classification of its literature suitable ten years ago. The Dewey Decimal System, rather commonly used, has become quite inadequate for classification purposes. Many of the titles find no place in the scheme and the classifier finds it impossible to do more than guess where some of the numerous books should be placed in this system; consequently the work of the classifier is open to the criticism of the user. Many troublesome errors of classification can easily be found, due entirely to the inadequate system.

From the user's point of view all books on psychology should be found together, and those on various phases of the subject should be grouped into units. According to the Dewey system, psychology books are classified under the general numbers 130-139 and 150-159, and these two groups are not neighbors on the shelves. Books such as those on applied psychology, physiological psychology, etc., are not provided for in the classification, and, although purchased by the psychological department, are to be found with books of the other sciences. Thus Dodge's *Psychological Effects of Alcohol*, has in one case been put in the chemical library, while applied psychology books are to be found in a half dozen different places.

Any new scheme must satisfy both the logical demand of the classifier and the practical one of the psychologist. The present scheme is a compromise between the Dewey decimal system and the plan on which the Psychological Index is constructed. It has been worked out by the writer in coöperation with the members of the department of psychology at Columbia University and with members of the library staff. It has been adopted by the Columbia University library, and has been in use for twelve months. All

new books purchased by the department are classified according to it, and the old books are being changed.

No scheme can make an intelligent classifier unnecessary, but this one simplifies and standardizes the work of the classifier, because he can refer to the Psychological Index for help in locating old books and thus learn how to place new ones. And often new ones are purchased after they are listed in the index, and can be located according to it. It offers chance for growth and subdivision in any department of the science, by the use of additional decimals. It brings all of the books recommended by the department together and provides place for such groups as physiological, applied, social and abnormal psychology.

One further advantage of the plan is that where there are department libraries subsidiary to the general library, books may be transferred from the latter to the former, and their numbers will provide proper grouping of the books for the various courses in psychology.

The plan of classification follows. The numbers in parenthesis represent the number of the group according to the Dewey System. All groups not marked with numbers in parenthesis are new.

150. PSYCHOLOGY—General textbooks and systematic treatises.  
(150) .1

.2

.3 Dictionaries and Encyclopedias.

.4 Essays.

.5 Periodicals.

.6 Societies, Transactions and Reports, etc.

.7 Methods.

.01 Study and Teaching.

.02 General Apparatus, Experimental and Statistical  
Technique.

.03 Tests.

.8 Collected Works.

.9 History and Biography.

.08 Collective Biography.

.09 Individual Biography.

151. PHYSIOLOGICAL PSYCHOLOGY.

(611.8) .1 Anatomy of Nervous System—Embryology, Histology,  
etc.

- (612.8) .2 Physiology—Cerebral Localization, Nerve Conduction, etc.

152. SENSATION AND PERCEPTION.

- (152) .1 Sensation and Sense Organs—General.  
.2 Vision and the Eye.  
.3 Hearing and the Ear.  
.4 Lower Senses and their Organs—Organic, cutaneous, muscle, tendon, joint, taste, smell, static, etc.  
.5 Perception—General.  
.6 Space Perception and Illusions—Stereoscopic Vision.  
.7 Perception of Time, Motion and Rhythm.  
.8 Psychophysics—Weber's and Fechner's Law, etc.

153. ATTENTION, MEMORY AND THOUGHT.

- (153) .1 Attention and Interest.  
(154) .2 Memory and Imagination—Association, Retention, Reproduction, Recall, Recognition, Imagery, etc.  
(155) .3 Thought—Meaning and Understanding.  
.4 Comparison, Abstraction, and Ideation.  
.5 Judgment and Belief—Reasoning.  
.6 Disorders of Attention, Memory and Thought.

154. FEELING AND EMOTION—Affection, Passion, Sentiment, Mood.

- (157) Temperament, Emotional Expression.

155. MOTOR PHENOMENA AND VOLITION—General.

- (158) .1 Reflexes and Automatic Functions.  
(159) .2 Instinct and Impulse.  
.3 Voluntary Movements—Dynamogenesis, Inhibition, Adjustment.  
.4 Work—Motor learning, Habit Formation, Practice, Transfer.  
.5 Fatigue—Mental and Physical.  
.6 Reaction Experiments.

156. SPECIAL MENTAL STATES.

- (133) .1 Sleep, Dreams, Narcosis.  
(134) .2 Hypnosis and Suggestion.  
(135) .3 Subconscious.  
.4 Psychical Research—Clairvoyance, Telepathy, Occultism, Spiritism, Magic.

157. ABNORMAL AND PATHOLOGICAL PSYCHOLOGY—(Psychiatry and other General Textbooks.)
- (131,  
132) .1 Mental Defect—Idiocy, Imbecility, Feeble-mindedness.  
 .2 Insanity—Senile Dementia, Dementia Præcox, Manic-Depressive Insanity, General Paralysis.  
 .3 Nervous Diseases—General (Aphasia, Apraxia, Epilepsy, Chorea).  
 .4 Psycho-neuroses—Hysteria, Double Personality, Neurasthenia, Psychasthenia, Fear Neuroses, Fixed Ideas.  
 .5 Mental Healing—Psycho-analysis, Psycho-therapeutics, Christian Science.
158. APPLIED PSYCHOLOGY—General.  
 .1 Educational—Textbooks, Problems of Education.  
 .2 Business—Invention, Advertising, Selling, etc.  
 .3 Industrial.  
 .4 Legal—Responsibility, Testimony, etc.  
 (131, .5 Vocational Guidance and Selection—Physiognomy, Phrenology, Astrology, Palmistry, etc.  
 133,  
138,  
139)
159. INDIVIDUAL, SOCIAL AND COMPARATIVE PSYCHOLOGY—General.  
 (136, .1 Individual Psychology—Self and Individual Differences,  
 137) Age, Sex, Adolescence, etc.  
 .2 Heredity and Evolution.  
 .3 Comparative Psychology—Animal Psychology.  
 .4 Social and Race Psychology.  
 .5 Psychology of Language.  
 .6 Psychology of Religion.  
 .7 Psychology of Ethics and Values.  
 .8 Psychology of Art—Æsthetics.

A. T. POFFENBERGER, JR.

COLUMBIA UNIVERSITY

## BOOKS RECEIVED

- WENLEY, R. M. *The Life and Works of George Sylvester Morris*. New York: Macmillan, 1917. Pp. xv + 332.
- PARKER, D. W. *The Self and Nature*. Cambridge: Harvard University Press, 1917. Pp. x + 316.
- [ANON.] *Playthings*. Bureau of Educ. Experiments, Bull. No. 1, New York, N. Y. Pp. 16. 10 cents.

- GARRETT, L. B. *Study of Animal Families in Schools*. Bureau of Educ. Experiments, Bull. No. 2. New York, N. Y. Pp. 19. 10 cents.
- [ANON.] *Experimental Schools (The Play School)*. Bureau of Educ. Experiments, Bull. No. 3. New York, N. Y. Pp. 22.
- [ANON.] *Experimental Schools (The Children's School, etc.)*. Bureau of Educ. Experiments, Bull. No. 4. New York, N. Y. Pp. 31. 10 cents.
- [ANON.] *Experimental Schools (The Stony Ford School, etc.)*. Bureau of Educ. Experiments, Bull. No. 5. New York, N. Y. Pp. 26. 10 cents.
- BOARDMAN, H. *Psychological Tests, a Bibliography*. Bureau of Educ. Experiments, Bull. No. 6. New York, N. Y. Pp. 75. 25 cents.
- GERRISH, F. H. *Sex Hygiene. A Talk to College Boys*. Boston: Badger, 1917. Pp. 51. 60 cents.
- WOOD, C. A. *The Fundus Oculi of Birds. A Study in Comparative Anatomy and Physiology*. Chicago: Lakeside Press, 1917. Pp. 181. \$15.00.
- LOWIE, R. H. *Culture and Ethnology*. New York: D. C. McMurtrie, 1917. Pp. 189.
- PARSONS, E. C. *Social Rule. A Study of the Will to Power*. New York: Putnams, 1917. Pp. 185. \$1.00.
- BERNHEIM, H. *Automatisme et suggestion*. Paris: Alcan, 1917. Pp. xv + 168. 2fr. 50.
- KITCH, E. M. *The Origin of Subjectivity in Hindu Thought*. Chicago: Univ. of Chicago, 1917. Pp. 82. 50 cents.
- LAY, W. *Man's Unconscious Conflict*. New York: Dodd, Mead, 1917. Pp. vi + 318. \$1.50.
- WASHBURN, M. F. *The Animal Mind. A Text-book of Comparative Psychology*. New York: Macmillan, 1917. (Second Edition.) Pp. xii + 386. \$1.90.
- HOLLINGWORTH, A. L. & POFFENBERGER, A. T., JR. *Applied Psychology*. Pp. xiii + 337. \$2.25.

## NOTES AND NEWS

THE August number of the BULLETIN was prepared under the editorial direction of Professor W. S. Hunter, of the University of Kansas.

MISS FRANCES LOWELL, assistant in psychology in the University of Minnesota, has been appointed research assistant in the department of research of the State School for Feeble-Minded at Faribault, Minnesota.

DR. J. F. DASHIELL has been appointed instructor in psychology in Oberlin College.

DR. H. R. CROSLAND has been appointed instructor in psychology in the University of Arkansas.

PROFESSOR ROBERT M. YERKES, chairman of the department of psychology of the University of Minnesota, who has recently accepted a commission as Major in the Sanitary Corps, has been granted leave of absence for so long as the government requires his services. Associate Professor Herbert Woodrow has been appointed to act as chairman during Major Yerkes' absence.

A NEW journal for neurology and allied subjects, *Schweizer Archiv für Neurologie und Psychiatrie*, is to be published at irregular intervals four times a year under the editorial direction of Professor C. v. Monakow and an editorial board of Swiss neurologists and psychiatrists.

THE following psychologists have been appointed, or requested to serve, in the Signal Office Reserve Corps, Aviation Section, non-flying: Major, J. B. Watson; Captains, M. Bentley, F. S. Breed, S. S. Colvin, G. V. Hamilton, V. A. C. Henmon, F. L. Wells.

THE following named psychologists have been recommended for commissions in the Sanitary Corps to serve as Psychological Examiners in National Army cantonments: Major, Robert M. Yerkes, Surgeon General's Office, in charge of psychological work; Lieutenants Clarence S. Yoakum, Marion R. Trabue, Jos. W. Hayes and Wm. S. Foster to serve as Chief Psychological Examiners; Lieutenants Geo. O. Ferguson, Jr., Walter S. Hunter, Edw. S. Jones, Karl T. Waugh, Heber B. Cummings, Edgar A. Doll, John T. Metcalf, Herschel T. Manuel, Carl C. Brigham, John E. Anderson, Horace B. English and Harold A. Richmond to serve as Psychological Examiners.

In addition to the above commissioned Examiners, the following have been given civil appointments for Psychological Examining: Doctors Leo J. Brueckner, Donald G. Paterson, A. S. Edwards, Rudolph Pintner, Benj. F. Pittenger, Ben. D. Wood, John W. Bridges, J. Crosby Chapman, John K. Norton, Edward C. Rowe, J. David Houser, C. P. Stone, Thos. H. Haines, Norbert J. Melville,

H. P. Shumway, Chas. H. Toll, Thos. M. Stokes, C. C. Stech, John J. B. Morgan, Raymond H. Wheeler, Harold C. Bingham, Carl R. Brown, Chester E. Kellogg, and Ralph S. Roberts.

Doctors Arthur S. Otis and Truman L. Kelley have been appointed members of the psychological staff in the Office of the Surgeon General with special responsibility for statistical work and the revision of methods of examining.

THE Committee on Classification of Personnel in the Army has been appointed by Secretary Baker and placed under the jurisdiction of the Adjutant General. This Committee has organized and is directing the occupational census and classification of the men in the National Army; has installed in the second series of Reserve Officers' Training Camps the system of personal records and ratings by which the men will be selected for commission; has coöperated with the Signal Corps, the Quartermaster Corps and other arms of the service in preparing application forms, qualification records, and other aids in sifting and assigning personnel; and has stimulated research on qualifications desired in aviators and on tests for selecting recruits to be trained for special duties. On the scientific staff of the Committee are the following psychologists: Walter Dill Scott, Director; E. L. Thorndike, Chairman; W. V. Bingham, Executive Secretary; James R. Angell, R. Dodge, R. B. Perry, J. F. Shepard, E. K. Strong, Jr., J. B. Watson, R. M. Yerkes, L. M. Terman. Dr. Terman gives up his work with the Committee to return to Stanford University October 1. Dean Angell has leave of absence from the University of Chicago and will be in Washington until January 1. The other members of the Committee are all giving part or full time to the work in Washington. They have the coöperation of R. C. Clothier, H. L. Gardner and sixteen other employment managers, of several army officers, and of a few volunteer assistants.

PROFESSOR F. A. C. PERRIN, of the University of Pittsburgh, has resigned to accept the position of adjunct professor of psychology at the University of Texas. Mr. J. U. Yarborough has been appointed instructor in psychology at the same institution.

